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(54) Manufacture of combined armature and commutator

(57) A combined armature and commutator blank (10) comprises a laminated core (14) mounted on and insulated from a shaft (12) by a moulding (16) which extends along the shaft beneath the site of the commutator segments (24) and is provided with axial slots for accepting and retaining inserts (24) which can be bent (22) to facilitate winding and which constitute segments (24) of the commutator. After the segments have been slid into position the armature is wound and the ends of the windings are connected to the bent-up ends (22) of the tin-plated copper segments.

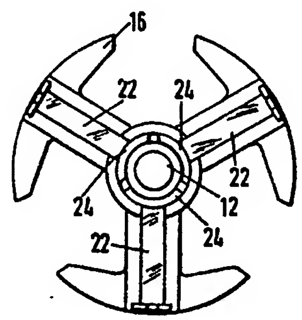

FIG. 3.

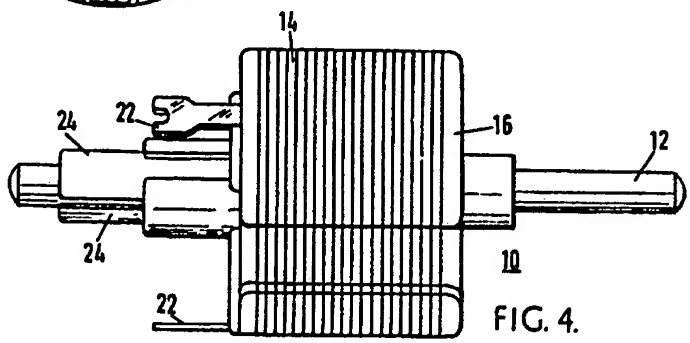

FIG. 4.

The drawing originally filed was informal and the print here reproduced is taken from a later filed formal copy.

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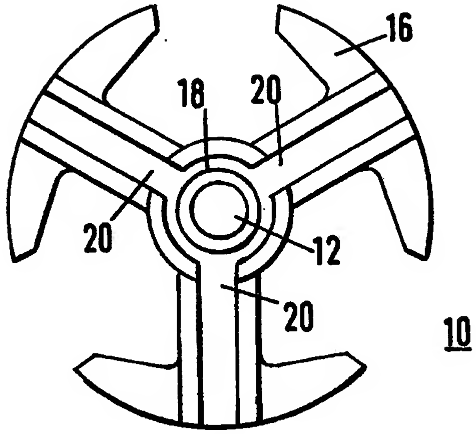

FIG.1.

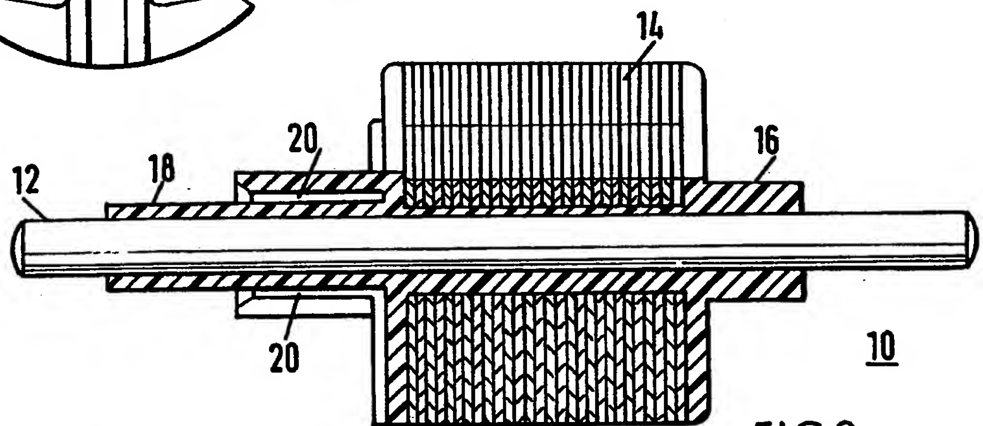

FIG.2.

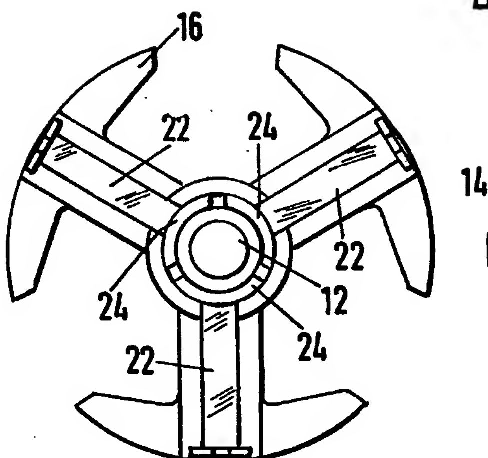

FIG.3.

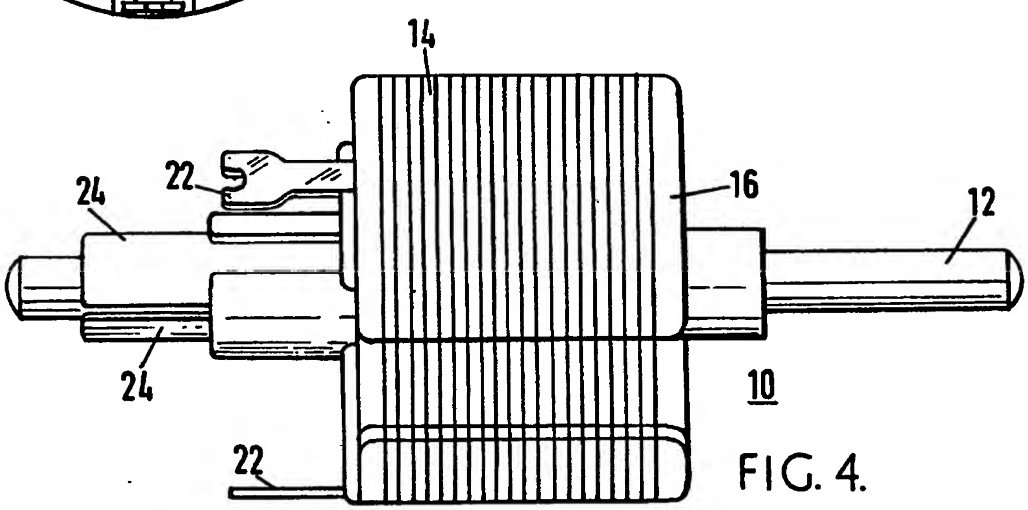

FIG. 4.

SPECIFICATION

Improvements in or relating to combined armatures and commutators

The present invention relates to the combination of armatures and commutators.

An armature as used in motors and generators consists of a laminated core of magnetisable material around which is wound an armature winding, the laminated core being mounted on a shaft. It is known to force fit the laminations directly onto the shaft. It is also known to provide a sleeve of insulating material on the shaft and to force fit the laminations onto the sleeve. In these known arrangements the commutator is slid onto the shaft as a separate operation after the laminations have been fitted. These methods of assembling the armature and commutator have inherent disadvantages.

A major disadvantage of the known methods of assembly is that it is extremely difficult to align the commutator and the armature with any great degree of precision. The precision of angular alignment between the commutator and the armature determines the high frequency noise characteristic of the final machine. Another disadvantage of the known methods is that the armature winding is difficult to wind onto the laminations, particularly if this process is automated.

Thus, it is desirable to increase the precision of the assembly whilst facilitating its execution and reducing its cost.

According to a first aspect of the present invention there is provided a combined armature and commutator blank comprising a core of magnetisable material, a shaft and a moulding of insulating material, serving to mount the core on the shaft, wherein the moulding has a section extending axially beyond the core and provided with axial slots for accepting and retaining electrically conductive commutator segments.

According to a second aspect of the present invention there is provided a method of manufacturing a combined armature and commutator blank comprising the steps of positioning a core of magnetisable material and a shaft in a mould and injecting an insulating material into the mould so as to mount the core on the shaft, wherein the mould is shaped so as to define an extension extending axially beyond the core, the extension being provided with axial slots for accepting and retaining electrically conductive commutator segments.

According to a third aspect of the present invention there is provided a method of manufacturing a combined armature and commutator comprising the steps of positioning - core of magnetisable material and a shaft in a mould and injecting an insulating material into the mould so as to mount the core on the shaft, the mould being shaped so as to define an extension extending axially beyond the core, the extension being provided with axial slots, positioning electrically conductive commutator segments in the slots so that legs which radially extend beyond the core, provided on and perpendicular to the commutator segments abut against an axial end of the core, winding a winding around the core and legs, securing and electrically connecting the winding to the legs and bending the portion of the legs radially extending beyond the core to lay parallel to the shaft.

The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:—

Figure 1 shows an end view of an embodiment of the present invention;

Figure 2 shows a sectional side view of the embodiment shown in Figure 1, the section being vertical along the axis;

Figure 3 shows an end view similar to Figure 1, but with the unit part assembled; and

Figure 4 shows a side view corresponding to Figure 3.

Referring to Figures 1 and 2, there is shown a combined armature and commutator blank 10. Figure 1 is an end view, viewed from the commutator end and Figure 2 is a sectional view taken vertically along the axis. The blank 10 is formed by positioning a shaft 12 together with an armature core 14 in a mould and then injecting an insulating material 16 into the mould so as to mould the two components together. The armature core 14 is formed from laminations of a magnetisable material in a conventional manner. The positions of the shaft 12 and the laminations 14 within the mould are such that after moulding the laminations 14 are mounted on and insulated from the shaft 12 by the insulating material 16. The insulating material 16 also covers the ends of the laminated core 14.

The moulding 16 axially extends in one direction so as to provide a base 18 on which the commutator can be built. The extension 18 of the moulding 16 is provided with three axial slots 20 for accepting and retaining copper inserts 22. Each of the slots 20 is aligned with a respective pole of the armature core 14 and each slot has an enlarged base region which may, as illustrated, communicate with each other. The copper inserts 22 are each provided with, at one end, a tin coated section 24. These sections 24 project from the axial slots 20 and constitute the segments of the commutator. The projecting sections 24 rest upon the end of the extension 18 which is of reduced dimensions for this purpose. Each copper insert 22 is provided with a leg which is perpendicular to the main body of the insert. The main bodies of the inserts 22 are dimensioned so that they may be fitted into the enlarged base regions of the slots 20, whilst the legs, which are of a reduced width, can pass along the top of the slots 20. Additional location of the legs is provided by radially extending channels formed in the moulding material 16 which covers the commutator end of the armature core 14.

After the inserts 22 have been fitted and the legs located in the radial channels, the armature is ready for winding. The winding is wound upon the

poles of the armature and at the relevant positions is engaged with the ends of the legs which are shaped to aid this operation. The insulation on the winding material is removed at the points of engagement with the legs for example by acid treatment, and the bared winding and legs are then treated with flux and soldered. When this arrangement has been completed the ends of the legs are bent parallel to the axis as shown in Figures 3 and 4.

Due to the fact that the armature and commutator blank 10 is formed as an integral unit the angular alignment of the commutator segments, that is the coated sections 24 of the inserts 22 retained in the slots 20, with respect to the poles of the armature can be very precisely controlled. The precision of this alignment determines the high frequency noise characteristics of the final machine. Another major advantage of a combined armature and commutator blank 10 is that the assembly of the armature winding may be greatly facilitated. The legs of the inserts 22 are initially perpendicular to the main body of the insert and thus when positioned in the blank 10 extend radially. This allows the winding to be easily wound upon the laminated core 14 since there are no axial obstacles to be avoided which is in contrast to known winding operations. The latter advantage is particularly useful when the assembly of the armature is to be automated.

CLAIMS

1. A combined armature and commutator blank comprising a core of magnetisable material, a shaft and a moulding, of insulating material, serving to mount the core on the shaft, the moulding having a section extending axially beyond the core and provided with axial slots for accepting and retaining electrically conductive commutator segments.

2. A combined armature and commutator blank as claimed in claim 1, wherein the core is formed of a plurality of laminations.

3. A combined armature and commutator blank as claimed in claim 1 or 2, wherein the axial slots are provided with enlarged base regions.

4. A combined armature and commutator blank as claimed in any of claims 1 to 3, wherein the axial ends of the core are covered by the moulding.

5. A combined armature and commutator blank as claimed in claim 4, wherein radial channels are provided in the moulding material covering the commutator end of the core for locating a leg provided on and perpendicular to each commutator segment.

6. A motor comprising a combined armature and commutator blank as claimed in any preceding claim, electrically conductive commutator segments positioned within the axial slots such that legs provided on and perpendicular to the commutator segments abut against an axial end of the core, a winding wound around the core and legs and electrically connected to the legs and brushes operably contacting the commutator segments.

7. A method of manufacturing a combined armature and commutator blank comprisng the steps of positioning a core of magnetisable material and a shaft in a mould and injecting an insulating material into the mould so as to mount the core on the shaft, wherein the mould is shaped so as to define an extension extending axially beyond the core, the extension being provided with axial slots for accepting and retaining electrically conductive commutator segments.

8. A method of manufacturing a combined armature and commutator comprising the steps of positioning a core of magnetisable material and a shaft in a mould and injecting an insulating material into the mould so as to mount the core on the shaft, the mould being shaped so as to define an extension extending axially beyond the core, the extension being provided with axial slots, positioning electrically conductive commutator segments in the slots so that legs which radially extend beyond the core, provided on and perpendicular to the commutator segments abut against an axial end of the core, winding a winding around the core and legs, securing and electrically connecting the winding to the legs and bending the portion of the legs radially extending beyond the core to lay parallel to the shaft.

9. A combined armature and commutator blank substantially as hereinbefore described with reference to the accompanying drawings.

10. A method of manufacturing a combined armature and commutator blank substantially as hereinbefore described with reference to the accompanying drawings.

11. A method of manufacturing a combined armature and commutator substantially as hereinbefore described with reference to the accompanying drawings.

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